

POPOV, Yu

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Shagayushchiy ekskavator ESh 4/40 walking excavator, 10) Yu. I.  
Popov ( 1 dr. ) Pod red. N. N. Kiseleva. Kiev, Mashin, 1956.  
152 p. Diagrams, tables.

KUBASOV, V.A.; POPOV, Yu.I.

Using a standard torsion testing machine for short-duration hot tests of steel specimens. Zav.lab.22 no.11:1366-1367 '56.  
(MLRA 10:2)

1. Moskovskiy institut khimicheskogo mashinostroyeniya.  
(Steel--Testing) (Testing machines)

PREOBRAZHENSKIY, M.A., kand. tekhn. nauk; POPOV, Yu.I., inzh.;  
STEFANENKO, S.A., inzh.

Mechanized storerooms for piece goods. Mekh. i avtom. proizv. 17  
no. 11:18-23 N '63. (MIRA 17:4)

POPOV, Yu.I.; SLIZKIY, P.I.; YELINSON, I.M.; LEVCHENKO, F.A.;  
KALASHNIKOV, Yu.T.; KISELEV, N.N., redaktor; LEUTA, V.I., inzhener,  
redaktor; HUDENSKIY, Ya.V., tekhnicheskii redaktor

[Model MSh 4/40 walking excavator] Shagaiushchii ekskavator  
MSh 4/40. Pod red. N.N.Kiseleva. Kiev, Gos.nauchno-tekhn.izd-vo  
mashinostroitel'noi lit-ry Ukrainskoe otd-ale, 1955. 152 p.  
(Excavating machinery) (MLRA 8:10)

LUKIN, A.V.; VASYANIN, K.I.; POPOV, Yu.K.

Inferior and undesirable fishes of the Tatar Republic, their significance in fishery and means for their economic utilization. Izv. Kazan. fil. AN SSSR. Ser. biol. i sel'khoz. nauk no. 2: 259-292 '50. (MLRA 10:2)  
(Tatar A.S.S.R.--Fishes)

POPOV, Yu.K.

Acclimatization and distribution of the raccoon dog (*Nyctereutes  
procyonoides* Gray) in different habitats of the Volga-Kama region.  
Izv. Kazan. fil. AN SSSR. Ser. biol. nauk no.4:27-48 '53.  
(Tatar A.S.S.R.--Dogs) (MLBA 10:6)

POPOV, V.A.; POPOV, Yu.K.; PRIYEZZHEV, G.P.; KULAYEVA, T.M.; VORONOV, N.P.;  
GARANIN, V.I.; NAZAROVA, I.V.; IZOTOVA, T.Ye.; KRASOVSKAYA, L.A.

Results of studying the animal kingdom in the flood zone of the  
Kuybyshev Hydroelectric Power Station. Trudy Kazan. fil. AN SSSR.  
Ser. biol. nauk no.3:7-217 '54 (MLRA 10:5)  
(KUYBYSHEV RESERVOIR REGION--ZOOLOGY)  
(WILD LIFE, CONSERVATION OF)

POPOV, Yu. K.

Materials on the raccoon dog in the Tatar A.S.S.R. Izv. Kazan. fil. AN  
SSSR. Ser. biol. nauk no.5:193-229 '56. (MIRA 10:6)  
(Tatar A.S.S.R.--Dogs)



RYBIN, S.F., otv. red.; STOROZHEV, N.A., red.; KIRISOV, A.G., red.;  
KYCHANOVA, N.I., red.; POFOV, Yu.K., red.; KOVRIGO, V.P.,  
red.; YERMOLAYEVA, N.G., red.

[The Udmurt land; collection of articles, stories. and  
verses about nature in the Udmurt A.S.S.R.] Krai Udmurtskii;  
sbornik statei, rasskazov, stikhov o prirode Udmurtii,  
Izhevsk, Udmurtskoe knizhnoe izd-vo, 1963. 75 p.  
(MIRA 18:2)

1. Vserossiyskoye obshchestvo sodeystviya okhrane prirody.  
Udmurtskoye otdeleniye.

FD-3275

USSR/Nuclear Physics - Pi meson interaction with nucleons

Card 1/1 Pub. 146 - 34/44

Author : Popov, Yu. M.; Rukhadze, A. A.

Title : Inelastic scattering of mesons in the semiphenomenological theory of the interaction of pi-mesons with nucleons

Periodical : Zhur. eksp. i teor. fiz., 29, No 6(12), Dec 1955, 893

Abstract : On the basis of the semiphenomenological theory of interaction of pi-mesons with nucleons, the problem of the nonelastic scattering of pi-mesons by nucleons was solved for energy of the incident mesons greater than 400 Mev (I. Ye. Tamm, Yu. A. Gol'fand, V. Ya. Faynberg, ibid., 26, 649, 1954), the calculation conducted in the first non-disappearing approximation of Heitler's theory of damping (W. Heitler, Proc. Cambr. Phil. Soc., 37, 291, 1941). They studied, after scattering, the states: nucleon+meson and "isobar"+meson, but did not consider the state nucleon+two mesons, formation of the second meson being considered as a decay of the nucleon's "isobar" state. In the present note the writers carry out a comparison with experiments for energies of the incident mesons higher than 400 Mev, and note that up to 400 Mev their results coincide with those of Tamm et alii (op. cit.). This note contains no new values of the constants not already given by Tamm et alii. Results are given in graph and table, theoretical and experimental. Good agreement is noted. Four references, all Western but one USSR (op. cit.).

Institution: Physical Institute im. P. N. Lebedev, Acad. Sci. USSR

Submitted : July 29, 1955

POPOV, Yu.M. Cand Phys-Math Sci -- (diss) "Dispersion of  
 $\pi$ -mesons in nucleons in the semiphenomenological theory and  
the higher approach of the method of Tamm-Dankov". Mos, 1957.  
6 pp 20 cm. (Acad Sci USSR. Phys Inst im <sup>(P.N.)</sup> Lebedev). 125 copies. Biblio-  
graphy: p 6 (10 names). (KL, 9-57, 99).

-4-

POPOV, IV. M

Distr: LE3d

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SCATTERING OF  $\pi$ -MESONS ON NUCLEONS IN HIGHER  
APPROXIMATIONS OF THE TAMM-DANCOFF METHOD.

by M. Popov (Academy of Sciences, USSR). Soviet Phys.  
JETP 5, 131-3 (1957) Aug.

3  
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AUTHOR.  
TITLE

POPOV, Yu.M.

PA - 2082

PERIODICAL

Scattering of  $\pi$ -Mesons on Nucleons in Higher Approximations of the  
TAMM-DANKOV Method (Rassejanie  $\pi$ -mezona na nuklone v vysshem približenii  
metoda Tamma-Dankova).

Zhurnal Eksperimental'noi i Teoret. Fiziki, 1957, Vol 32, Nr 1,

pp 169-171 (U.S.S.R.)

Received 3/1957

Reviewed 4/1957

ABSTRACT

In the problem investigated here problems in connection with renormalization of self energy of mesons and nucleons are not considered and the corresponding terms are left out in all equations. The equation system obtained in this manner is in the "old" TAMM-DANKOV method identical with the system of the new method of DYSON, if, in the latter system, the amplitudes with "negative members" are left out. In momentum representation, the first of the mentioned amplitudes is set up according to DIRAC in the following manner:  $\langle a_{qb} b_{-q} \rangle = \delta(q - q_0) + K_1(qq_0)\delta + (\xi - \omega_q - E_q)$   
Investigating the problem of higher approximations of the TAMM-DANKOV method the inequation  $\xi < m + 2\mu$  is assumed (i.e. no additional mesons are produced) and the second amplitude has the following form:  
The equations for  $K_1$  and  $K_2$  are then explicitly given. This equation system still contains divergencies even after the elimination of the infinities occurring in the nuclei. This fact represents the main difficulty when investigating the higher approximations of the T.D.-method, if the equation for a meson-nucleon-system is concerned. The author constructs such a solution of non-covariant (threedimensional) equations in which the

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Scattering of  $\pi$ -Mesons on Nucleons in Higher Approximations of the  
TAMM-DANKOV-Method.

infinities are contained in the functions for the "summit parts" and which can be eliminated by renormalization. The representation of the amplitude  $K_2(qkq_0)$  by means of the resolvent  $R_2$  is explicitly given. Some transformations are then performed which are intended to introduce the infinities contained in the equation system into the functions for the "summit parts". The practical solution of the above equations is impossible without separation of the angular variables. The authors separated the angles in the equation for  $K_2(qkq_0)$  for the case that the total angular momentum of the system of nucleon - 2 mesons is  $J = 1/2$  and that the mesons can only have the angular momenta 0 and 1. This makes it possible to consider higher approximations for the scattering of a pion by a nucleon in the S-state. Next, formulae for the characterization of the rotation state of 2 mesons and one nucleon and of a state containing one nucleon and one meson with  $l = 0$  are given. Also the equations for the "summit parts" are given. Finally a formula for the phase shift on the occasion of the scattering of a pion by a nucleon in the state which the isotopic spin  $I = 3/2$  is found. Physical Institute "P.N.LEBEDEV" of the Academy of Sciences of the USSR.

ASSOCIATION  
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Card 2/2

24 (3)

SOV/56-35-2-27/60

AUTHOR:

Popov, Yu. M.

TITLE:

On the Cross Sections of the Possible Non-Radiation  
Recombination in a Semiconductor (O secheniyakh vozmozhnoy  
bezyluchatel'noy rekombinatsii v poluprovodnike)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958,  
Vol 35, Nr 2 (8), pp 505-506 (USSR)

ABSTRACT:

In semiconductors, a process of non-radiation recombination may occur; it is the inverse process with respect to the ionization by conduction electrons (or holes) of the electrons which come from the traps. Using the wave functions and the assumptions given in a paper by L. Bess (Ref 1), the author calculated the collision of a thermal hole with slow conduction electrons in the neighbourhood of an occupied trap with subsequent recombination of the trap electron with the hole (the trap electron is considered as an ~~unoccupied~~ level for the hole). The energy released in such a collision is assumed to be transferred to the conduction electron. The wave functions which are used for these calculations and the obtained cross sections of these

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On the Cross Sections of the Possible Non-Radiation  
Recombination in a Semiconductor

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processes are explicitly given. For carrier concentrations  $N_e$  and  $N_h \sim 3 \cdot 10^{13} \text{ cm}^{-3}$ , the cross sections  $\sigma_{1e}$  (of the collision of a conduction electron with a hole with transition of the electron to the unoccupied level of the impurity) and  $\sigma_{2e}$  (of the collision of 2 conduction electrons with subsequent transition of one of these conduction electrons to an unoccupied level of the impurity) are of the same order of magnitude ( $3 \cdot 10^{-21} \text{ cm}^2$ ) and are one order of magnitude less than the cross section of the radiation recombination ( $\sigma_{re}$  and  $\sigma_{rh}$ ) which were obtained by Bess. The above-mentioned mechanism of the non-radiation recombination therefore cannot explain the experimentally observed short life of the carriers in germanium if the concentration of the carriers amounts to  $\sim 3 \cdot 10^{13} \text{ cm}^{-3}$ . There is 1 reference, 0 of which is Soviet.

ASSOCIATION: Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR  
Card 2/2  
5 (Physics Institute imeni P. N. Lebedev, AS USSR)



24(4)

SOV/51-6-6-7/34

AUTHOR: Popov, Yu. M.

TITLE: Dependence of the Light-Sum Stored at Levels of various Depth on the Excitation Density (Zavisimost' zapasayemoy svetosummy na urovnyakh raznoy glubiny ot plotnosti vozbuzhdeniya)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 6, Nr 6, pp 764-768 (USSR)

ABSTRACT: It was found experimentally (Refs 1, 2) that under steady-state conditions in luminescence the ratio of the light-sum stored in deep levels to the light-sum stored in shallow levels decreases with increase of the excitation (flux) density. The present paper shows that it is not necessary to invoke a mechanism of de-exciting action of the excitation flux to explain the above result. The author considers a phosphor with two capture levels of different depth. It is assumed that (1) electrons are attached to and ejected from capture levels by thermal vibrations of the lattice and (2) direct transition of electrons from capture levels to holes of the valence band does not occur. In the author's opinion the first assumption is always true, while the second is correct only in the case of absence of holes in the valence band. It is shown that under steady-state conditions the ratio of the number

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Dependence of the Light-Sum Stored at Levels of Various Depth on the Excitation Density

of electrons stored at deep levels to the number stored at shallow levels is proportional to a product of two quantities: one of these quantities is the ratio of the total number of deep levels to the total number of shallow levels, while the other quantity always decreases with increase of the excitation density. The paper is entirely theoretical. Acknowledgment is made to Professor V.L. Levshin for his advice. There are 2 figures and 2 references, 1 of which is Soviet and 1 English.

SUBMITTED: May 12, 1958.

Card 2/2

24(4)

SOV/51-6-6-2/34

AUTHORS: Popov, Yu.M. and Shabanskiy, V.P.

TITLE: Effect of Radiationless Recombination on Saturation in Cathodoluminescence.  
(Vliyaniye bezyzluchatel'noy rekombinatsii na nasyshcheniye pri  
katodolyuminestsentsii)

PERIODICAL: Optika i spektroskopiya, 1959, Vol 6, Nr 6, pp 769-775 (USSR)

ABSTRACT: The paper was presented at the Seventh Conference on Luminescence. The authors solve kinetic equations for particles in the conduction band and at capture levels, taking part in luminescent processes. Triple recombination, which occurs at high free charge-carrier densities is allowed for in these equations (triple recombination is defined as radiationless recombination which is the reverse of the process of ionization removal of electrons from traps by conduction electrons or by holes). It is shown that the non-linear portion of cathodoluminescence yield (saturation effect) occurs at the high free electron and hole densities at which triple recombination appears. Theoretical predictions of the cathodoluminescence yield and its dependence on the excitation intensity were found to agree with experiment. In the final section the

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SOV/51-6-6-9/34

Effect of Radiationless Recombination on Saturation in Cathodoluminescence

authors give the energy balance of electrons in recombination processes and they estimate the electron temperature in the phosphor. The paper is entirely theoretical. Acknowledgments are made to V.L. Levshin and M.V. Fok for their advice. There are 2 figures and 6 references, 3 of which are Soviet and 3 English.

SUBMITTED: May 12, 1958.

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SOV/61-7-5-18/21

AUTHOR: Popov, Yu.M.

TITLE: The Effect of Fast Electrons on the Stored Light-Sum in Cathodo-Luminescence

PERIODICAL: Optika i spektroskopiya, 1959, Vol 7, Nr 5, pp 697-702 (USSR)

ABSTRACT: Phosphorescence under the action of an electron beam is known to decay faster in most phosphors when the beam density is increased (Ref 1). As in photoluminescence, the higher rate of decay is due to a greater degree of filling of shallow levels, compared with deep levels, with increase of the excitation intensity. A second possible reason for the faster decay of phosphorescence (i.e. a lower degree of filling of deep levels) is discussed in the present paper: it is suggested that electrons may be knocked out of capture levels by fast electrons which are formed in the conduction band due to ionization losses of the primary cathode-ray beam. The author calculates density of the primary electron beam at which the probability of knocking out electrons from deep capture levels into the conduction band, due to ionization, is comparable with thermal ejection; such a density is shown to be quite possible in practice. The paper is entirely theoretical. Acknowledgment is made to V.A. Chuyenkov for his advice. There are 12 references, 9 of which are Soviet and 3 English.

Card 1/1

SUBMITTED: March 5, 1959

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24(3)

AUTHORS:

Basov, N. G., Vul, B. M., Popov, Yu. M.

SOV/56-37-2-54/56

TITLE:

Quantum-mechanical Semiconductor Generators and -Amplifiers of  
Electromagnetic Oscillations

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,  
Vol 37, Nr 2(8), pp 587-588 (USSR)

ABSTRACT:

In the present "Letter to the Editor" the authors discuss the possibility of using the electron transitions between the conductivity zone (valence zone) and donor (acceptor) impurity levels of a semiconductor for the production of electromagnetic radiation (like in a molecular generator). For the realization of semiconductor generators and -amplifiers it is necessary to provide for such a distribution of electrons (holes) in the conductivity zone (valence zone) that the effective temperature of the conductivity electrons (holes) is negative with respect to the ionized donors (acceptors). Such a semiconductor has negative frequency losses in the case of transitions of electrons (holes) from the conductivity (valence) zone to impurity levels. If such a semiconductor is irradiated with electromagnetic waves, the latter may be amplified; if certain conditions (self-excitation)

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Quantum-mechanical Semiconductor Generators and  
-Amplifiers of Electromagnetic Oscillations

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are satisfied, such a device may work as generator. In order to attain negative temperatures, a special impurity ionization mechanism is suggested. This state with negative temperature is maintained during the relaxation time of electrons (holes) with the impurity levels. If the number of impurities is small compared to the number of atoms in the crystal lattice, the life time of the conductivity electrons (holes of the valence zone)  $\tau_2$  is large compared to the time  $\tau_1$  between the collisions of electrons (holes) with the lattice.  $\tau_2$  may be regulated by the impurity concentration. During the period  $\tau_2$  the system may be used as a generator or as amplifier of electromagnetic oscillations. A reduction of the surface

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Quantum-mechanical Semiconductor Generators and  
-Amplifiers of Electromagnetic Oscillations

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reflection coefficient or of the dimensions of the sample may  
convert the system from the function as generator to that of an  
amplifier. The present paper was registered by the Committee  
of Inventions and Discoveries of the USSR Council  
of Ministers with priority of July 7, 1958.  
There are 3 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk  
(Physics Institute imeni P. N. Lebedev of the Academy of  
Sciences)

SUBMITTED: May 18, 1959

Card 3/3



POPOV, Yu.M.; SELIVANENKO, A.S.

Luminescence of a free exciton in a molecular crystal. Opt. i spektr.  
9 no.2:260-261 Ag '60. (MIRA 13:8)  
(Luminescence) (Excitons)

02430

S/056/60/038/03/31/033  
B006/B014

24.7700

AUTHORS:

Basov, N. G., Krokhin, O. N., Popov, Yu. M.

TITLE:

Semiconductor Amplifiers<sup>25</sup> and Generators<sup>25</sup> Whose Carriers Have a Negative Effective Mass

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 38, No. 3, pp. 1001-1002

TEXT: Kroemer (Ref. 1) made the suggestion to use carriers with a negative effective mass in semiconductors for the amplification and generation of electromagnetic waves<sup>25</sup>, since negative losses will thus occur during the motion of carriers in the field. In order to produce such states it is advisable to use a constant electric field. In the present "Letter to the Editor" the authors demonstrate that it is impossible to produce states with negative losses by using a constant electric field. The condition  $wf(\epsilon_2)[1-f(\epsilon_1)]n(\hbar\omega) - wf(\epsilon_1)[1-f(\epsilon_2)]n(\hbar\omega) = -wn(\hbar\omega)\{f(\epsilon_2)-f(\epsilon_1)\} > 0$  must be satisfied for the energies  $\epsilon_2 > \epsilon_1$  ( $f(\cdot)$  is the electron distribution function,  $n(\hbar\omega)$  is the number of

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Semiconductor Amplifiers and Generators Whose  
Carriers Have a Negative Effective Mass

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photons of an energy  $\hbar\omega = \epsilon_2 - \epsilon_1$ ,  $w$  is the probability of spontaneous emission). To obtain amplification, it was necessary that  $\partial f(\epsilon)/\partial \epsilon > 0$ , at least at some points of the range  $\epsilon_2 - \epsilon_1$ . This is nowhere the case if thermodynamic equilibrium is to be maintained. Direct calculations (Refs. 2-5) have shown that it is impossible to disturb thermodynamic equilibrium so strongly that  $\partial f(\epsilon)/\partial \epsilon > 0$ , if  $E = \text{const}$ , as was assumed by Kroemer. Also if in the case of anisotropic zones some components of the mass tensor are negative for certain values of the quasi-pulse,  $\partial f/\partial \epsilon > 0$  cannot be attained if  $E = \text{const}$ . This is due to the fact that in the case of semiconductors the interaction constant for acoustical and optical phonons is of the same order of magnitude. For a system of semiconductors with negative losses it is therefore necessary to obtain states with negative temperatures if  $\partial f/\partial \epsilon > 0$ . There are 6 references, 3 of which are Soviet.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR  
(Physics Institute imeni P. N. Lebedev of the Academy of  
Sciences, USSR)

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83601

S/056/60/038/005/034/050  
B006/B063

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24.7700

AUTHORS:

Krokhin, O. N., Popov, Yu. M.

TITLE:

Slowing-down Time of Non-equilibrium Carriers in Semiconductors

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 38, No. 5, pp. 1589-1592

TEXT: The determination of the slowing-down time of minority carriers is particularly important to the development of quantum-mechanical semiconductor generators and amplifiers. Negative losses in semiconductors may occur if the production time for negative temperatures in them (slowing-down time) is shorter than the lifetime of the produced external excitations of fast electrons and holes. The authors regard those electrons (holes) as minority (fast) carriers, the initial energy  $\epsilon_0$  of which is considerably higher than the mean thermal or degeneration energies (if the gas is degenerate), but not higher than the threshold energy of impact ionization of the valency band. In sufficiently pure crystals of regular shape, the slowing down of electrons is due to scattering by lattice vibrations. Impurities and defects need not be taken into account. The following

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Slowing-down Time of Non-equilibrium  
Carriers in Semiconductors

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calculations, which are only made for electrons of the conduction band, hold analogously for the holes of the valency band. The calculations proceed from the equation of motion for the electron distribution function  $f(\vec{p})$  in the crystal, taking the Fermi degeneracy of the electron gas into account. In order to investigate the slowing-down of electrons in the absence of an electric field and with  $f(\vec{p}) \equiv f(\epsilon)$ , where  $\epsilon$  is the electron energy ( $\epsilon = p^2/2m$ ), the authors first give expressions for  $\partial f(\epsilon)/\partial t$ , the electron lattice collision time  $\tau$ , the energy state density  $g(\epsilon)$ , and the variation of the mean electron energy in time  $dE/dt$ . By use of these relations they study the slowing down of a single electron without considering degeneracy.  $f(\epsilon)g(\epsilon) = \delta(\epsilon - E)$  holds in this case. The case of an acoustic phonon is treated first. For the slowing-down time from  $E_0$  to  $E$  due to electron scatterings by acoustic lattice vibrations one obtains:

$$t = (2/a_0)(E^{-1/2} - E_0^{-1/2}); a_0 = 2(2m)^{1/2} u^2/l_{ac}(T)kT,$$

where  $l_{ac}$  is the mean free path of the electron in scattering,  $u$  is the velocity of sound, and  $T$  is the lattice temperature. Next, the authors investigate the slowing down of a fast electron by optical lattice vibrations of a valence-type semiconductor. An expression is derived for  $t_{opt}$ . Furthermore,

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Slowing-down Time of Non-equilibrium  
Carriers in Semiconductors

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$t_{\text{opt}}/t_{\text{ac}} \approx 10^{-2}$  holds. In the following, degeneracy is taken into account and the slowing-down times are compared with one another, both regarding and disregarding degeneracy. It is found that the slowing-down time is not essentially influenced by taking degeneracy into account. N. G. Basov is thanked for discussions. B. I. Davydov and L. V. Keldysh are mentioned. There are 5 references: 3 Soviet, 1 US, and 1 British.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR  
(Institute of Physics imeni P. N. Lebedev of the Academy  
of Sciences USSR)

SUBMITTED: December 17, 1959

Card 3/3

86932

S/056/60/039/005/051/051  
B006/B077

24.7700 (1043,1143,1559)

AUTHORS:

Basov, N. G., Krokhin, O. N., Popov, Yu. M.

TITLE:

The Possibility of an Application of Indirect Transitions  
to Produce Negative Temperature in Semiconductors.

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 39, No. 5(11), pp. 1486 - 1487

TEXT: In some semiconductors, especially in germanium and silicon, the infrared emission and absorption edges correspond to the indirect transitions, that is during emission and absorption of a photon emission or absorption of a phonon takes place simultaneously. The long wave emission corresponds to simultaneous emission of photon+phonon on these transitions. In a sample with a low enough temperature where the phonons necessary for absorption are missing in the lattice, the emission with the longest wave will not be absorbed and here the sample will be practically transparent. If the carrier concentration is increased with

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The Possibility of an Application of  
Indirect Transitions to Produce Negative  
Temperature in Semiconductors

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respect to the equilibrium concentration by means of any mechanism (exposure, electric field etc.) then under certain conditions a negative temperature should occur with respect to the considered transitions. The conditions for such a process should be:  $\omega_r/\omega_f < T_{eff}/T$ , where  $\omega_r$  and  $\omega_f$  is the photon and phonon frequency,  $T$  the temperature of the sample and  $T_{eff}$  the effective temperature where the levels of the conduction band with respect to those of the valence band are filled. For germanium would hold  $\omega_r/\omega_f \sim 25$  and thus  $T_{eff}/T > 25$ , which would be fulfilled for a sample at helium temperature if the excitation is brought about by a radiation source or an external electric field. There are 10 references: 1 Soviet, 8 US, 1 Czechoslovakian.

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva Akademii nauk SSSR  
(Physics Institute imeni P. N. Lebedev, Academy of Sciences  
USSR)

SUBMITTED: October 3, 1960  
Card 2/2



6.3200 (2503, 2803)

6.3300 (2201, 2801, 2503)

85900

S/053/60/072/002/001/005  
B006/B067

AUTHORS: Basov, N. G., Krokhin, O. N., and Popov, Yu. M.

TITLE: Generation, Intensification, and Detection of Infrared <sup>28</sup>  
and Optical Radiation by Means of Quantum Systems <sup>21</sup>

PERIODICAL: Uspekhi fizicheskikh nauk <sup>21</sup> 1960, Vol. 72, No. 2  
pp. 161 - 209

TEXT: The present paper gives comprehensive survey of the theory, the possibilities of application, and the properties of molecular generators and intensifiers. In the introduction the authors discuss the sources of electromagnetic radiation which they divide into three groups (thermal source, luminescence source, and generators) and which differ above all by the width of the emission spectrum. They then discuss the principle of the generation and intensification of waves which is based on the induction of transitions in quantum systems (molecules, atoms, ions, etc.). Molecular generators, and paramagnetic intensifiers may be used for the generation and

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Generation, Intensification, and  
Detection of Infrared and Optical  
Radiation by Means of Quantum Systems

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S/053/60/072/002/001/005  
B006/B067

intensification of submillimeter infrared and optical waves. To produce such generators and intensifiers it is necessary to obtain a system which is not in thermodynamic equilibrium (i.e. in a state with negative temperature). In such a state the occupation of the energy levels is bound to increase with increasing energy, and the system is bound to emit photons under the influence of a radiation impinging from outside. It may be used not only for the generation but also for the intensification of radiation. In spite of the spontaneous radiation such intensifiers are considerably sensitive in the infrared. It has already been suggested to use spectral lines of different materials for producing highly sensitive radiation indicators which are free from noises of spontaneous radiation. One of the most important characteristics of such a system with negative temperature is the "number of active particles", i.e., the particle excess on the upper levels compared with the lower ones which are generated per unit time. Another important characteristics is the quantity  $\chi = 2\pi |d|^2 n / \Delta \omega$ , where  $|d|^2$  is the square of the matrix element

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Generation, Intensification, and  
Detection of Infrared and Optical  
Radiation by Means of Quantum Systems

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B006/B067

of the dipole moment between the levels concerned,  $n$  the number of the active particles, and  $\Delta\omega$  the spectral line width. The quantity  $K$  enters the condition of the self-excitation of the generators and determines the intensification coefficient of the intensifier, as is shown in part 8. In molecular gases  $K$  is in the cm range only  $1/10^3$  of the value it has in crystals of paramagnetic ions. Similar conditions prevail also in the infrared. Hence the use of solids seems to be the most promising. The present paper which gives a survey of published data and the results obtained in this field is presented in the following way: Chapter I: methods of obtaining states in systems with negative temperatures. The theory of negative temperatures; sorting of molecules by means of an inhomogeneous electric or magnetic field in molecular beams; the excitation of gas molecules by means of gas discharge; momentum method of producing negative temperatures in semiconductors; production of negative temperatures in semiconductors between levels lying within one conduction band ("amplifier with negative mass"); production of negative temperatures by the method

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of double resonance. Chapter II: Interaction between radiation and systems with negative temperature; conditions of self-excitation; theory and suggestions for the production of resonators and intensifiers; quantum indicators of radiation. Finally, it is pointed out that quantum systems are of great importance in the generation and intensification of electromagnetic cm and dm waves, especially for radio engineering. Increase in the frequency stability and considerable increase in the receiver sensitivity. With ammonia molecular generators already high frequency stability was attained. The noise temperature in this region is at about 1°K. Research in this field leads to a new branch of physics: quantum radiophysics. V. A. Fabrikant is mentioned. There are 23 figures and 80 references: 33 Soviet, 34 US, 3 Japanese, 7 Australian, 2 British, and 1 French.

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BASOV, N.G.; KROKHIN, O.N.; POPOV, Yu.M.

Generation, intensification, and indication of infrared and optical  
radiation with the aid of quantum systems. Usp. fiz. nauk 77  
no.2:161-209 O '60. (MIRA 16:8)  
(Radiation) (Quantum theory)

POPOV, Yu. M., BASOV, N. G., and KROKHIN, O. N.

"Negative Absorption Coefficient at Indirect Transitions in Semiconductors."

Report presented by N. G. Basov at the 2nd Intl. Conference on Quantum Electronics, 23-24 Mar 1961, Berkeley, California.

ABASOV, A. G., POPOV, Yu. M. and KROKHIN, O. N.

"Negative Absorption Coefficient at Indirect Transitions in Semiconductors."

report presented at the Hungarian Symposium on Luminescence, Balatonvilagos, Hungary, 7-10 June 1961.

20847

9.4/50 (also 1137, 1138, 11395)

S/048/61/025/003/036/047  
B104/B202

AUTHOR: Popov, Yu. M.

TITLE: Characteristic features of cathodoluminescence for high excitation densities

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, v. 25, no. 3, 1961, 405-408

TEXT: This paper was presented at the 9th conference on luminescence (crystal phosphors) Kiyev, June 20 to 25, 1960. The author theoretically studies processes showing two important properties of cathodoluminescence at high excitation densities: 1) deviation of the linear increase of brightness of luminescence with an increase in the excitation density which is called saturation effect. 2) Rising slope of the damping curve of the afterglow of cathodoluminescence with an increase in excitation density. To explain the saturation effect which is connected with thermal extinction, already earlier, a triple recombination process had been assumed in which after the collision of two carriers one of them settles at an impurity center. It transfers its energy to the other carrier from

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S/048/61/025/003/036/047  
B104/B202

Characteristic features of...

which, in turn, it is given up without radiation on relaxation with the lattice. It was found by calculations that under these conditions linearity of brightness as a function of the carrier density deviates at an excitation density of  $10^{24}$  particles per  $\text{cm}^3$  and second if the concentration of the mobile carrier in the conduction band attains the value  $N \approx 10^{16} \text{ cm}^{-3}$ . The relative increase of the light sum which in contrast to the light sum which is stored at the deep levels, is stored at the shallow levels, is regarded as one of the reasons of the increase in the damping velocity of the afterglow of cathodoluminescence. It was found by theoretical considerations that with increasing excitation density the number of the electrons stored at the deep levels becomes smaller than that of electrons stored at the shallow levels. The light sum which is set free at the deep levels is also reduced by the knocking out of electron from the adhesion levels by fast electrons. Assuming that the main processes occurring in a solid are ionization processes and that electrons are generated by the primary electron beam in the conduction band of crystal phosphor whose kinetic energy is lower than the forbidden zone width, the following expression is obtained for the

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probability of an ejection caused by fast electrons:

$$W_k^{(k)} = \frac{c_0 M a^2 E_R Q \ln(\mathcal{E}_0 / I^{(k)})}{\pi m \gamma^2 Z^2 e^4 \ln(4 \mathcal{E}_0 / \hbar \omega_0)} \quad (4)$$

where  $M$  is the reduced ion mass,  $E_R$  the Rydberg energy,  $Q$  the number of electron-hole pairs. From this expression the authors obtain the condition

$$Q \geq 10^{28} \exp(-I^{(k)}/kT).$$

If this condition is satisfied, the probability of an ionization ejection from the  $k$ -th level is greater than that of a thermal ejection. Hence, the light sum is limited by the excitation density which is released from the low levels. The probability of an ionization of an adhesion level is not temperature-dependent, the probability of a thermal ejection, however, is exponentially reduced with temperature. There are 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. X

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva Akademii nauk SSSR  
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

Card 3/3

292h1 S/026/61/000/012/002/003  
D037/D113

9,2574 (also 1158,1055)

AUTHORS: Basov, N.G., Krokhin, O.N., and Popov, Yu.M.

TITLE: Generators and amplifiers of light

PERIODICAL: Priroda, no. 12, 1961, 16-25

TEXT: This article deals with the development of quantum radiophysics and the theory, development and application of generators of monochromatic, optical and infrared radiation. In 1952, a new principle of generating and amplifying electromagnetic radiation in quanta systems, based on induced radiation, was proposed by N.G. Basov and A.M. Prokhorov. In 1954-55, the first quantum generators of the electromagnetic waves of the centimeter band, based on induced radiation, were built. Quantum amplifiers of the centimeter and decimeter wavebands, used for increasing the sensitivity of receiving equipment and proposed for the first time in 1956 by N. Blumbergen, are based on the 3-level system studied by N.G. Basov and A.M. Prokhorov. Optical generators, based on the same principles, were proposed for the first time in the USSR in 1957-58 by Basov, Prokhorov, B.M. Vul and Yu.M. Popov. It is stated that world-wide attempts are being made to use quantum systems ✓  
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29241 S/026/61/000/012/002/003  
D037/D113

# Generators and amplifiers of light

for the creation and development of generators and amplifiers in the meter and ultraviolet wavebands and possibly also in shorter wavebands. The authors give a very general explanation of resonance absorption, induced and spontaneous radiation, and quanta systems working with "negative temperature". They point out the need to develop devices ensuring the possibility of obtaining monochromatic radiation with the aid of media of finite dimensions, suggesting in this connection the use of a system of parallel mirrors. In radiowave generators, the parallel mirrors are replaced by a resonator which can concentrate all radiation energy on one type of oscillation, thus ensuring high-directivity radiation and monochromatization. Discussing generators of optical and infrared radiation, the authors describe two types of generators, one of them using a mixture of helium (pressure 1 mm Hg) and neon (0.1 mm Hg) excited by low-temperature discharge and enclosed in a quartz envelope. In the second type, spectral radiation lines of various solids, mainly monocrystals excited by intensive optical radiation, are used. The monocrystal of a synthetic ruby has latterly been replaced by uranium and samarium ions in calcium fluorite. Semiconductors, used instead of luminescent crystals in optical and infrared radiation generators, also give very good results: accomplishment of electrical excitation methods, high density

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Generators and amplifiers of light

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S/026/61/000/012/002/003  
D037/D113

of the excited centers, and the possibility of changing the generation rate in the magnetic field. In the high light concentrations of optical waveband generators, the light pressure may be up to 1 million at. and may be used for studying the properties of substances on strong electrical fields, acceleration of charged particles, acceleration of chemical reactions and exact processing of various materials. Soviet scientist V.A. Fabrikant is mentioned in connection with research work in this field. There are 8 figures and 2 Soviet-bloc references.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva AN SSSR (Moskva )  
(Physics Institute im. P.N. Lebedev of the AS USSR (Moscow))

4

Card 3/3

6.3300 (incl. 2605)  
6.3000 (2105, 1106, 1138)

21319  
S/030/61/000/003/004/013  
B105/B215

AUTHORS: Basov, N.G., Krokhin, O.N., Popov, Yu.M.

TITLE: Generation of coherent light by means of solids

PERIODICAL: Vestnik Akademii nauk SSSR, <sup>31</sup>no. 3, 1961, 61 - 66

TEXT: A short survey is given on methods of producing generators for optical and infrared radiations, in which quantum transitions among energy levels in solids, luminophores, and semiconductors are utilized. Infrared and optical generators are mentioned which are based upon the principle of induced radiation in quantum systems of negative temperatures (N.G. Basov, A.M. Prokhorov, 1954), highly coherent radiation sources of luminescent substances in infrared and optical spectral regions, exciting by strong optical radiation (T.G. Mayman, D.F. Nel'son, A.L. Shavlov, P.P. Sorokin, 1960). The production of such sources is closely related to the problems of interaction between radiation and substance, structures of the energy levels of the substances, probability of radiation and nonradiation processes. S.I. Vavilov contributed considerably to the solution of these problems. The action of permanent afterglow of organic luminophores which

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B105/B215

have been discovered by S.I. Vavilov and V.L. Levshin (1928) possibly is used for creating new sources of light. P.P. Feofilov (student of S.I. Vavilov) together with L.N. Galkin studied (1957) in detail absorption bands and emission of  $U^{+++}$  in calcium fluorite. Resonators are used to increase the interaction between radiation and substance of negative temperature (A.M. Prokhorov, 1958; A.L. Shavlov, 1958). Furthermore, a report is given on the generation of optical and infrared radiation by applying activators in corundum and calcium fluorite. The optical radiation source used was a corundum crystal ( $Al_2O_3$ ) with of  $Cr_2O_3$  impurities (0.05 per cent by weight). The wide absorption band of the  $^{4F_2}$  transition level

$^{4A_2}$  to  $^{4F_2}$  corresponds to a wavelength of  $\sim 5600$  A. Fig. 2 shows a schematic representation of the uranium ion level in the calcium fluorite crystal. Some methods of creating negative temperatures in semiconductors are recommended (N.G. Basov, B.M. Vul and Yu.M. Popov, 1958) for generating infrared and optical radiations by semiconductors. Negative temperatures of semiconductors can be reached by intrazonal electron-hole transitions, and by intrazonal transitions and transitions from the base region to the level of impurity atoms. So far, there exists no general

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Generation of coherent light ...

S/030/61/000/003/004/013  
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theory on the determination of the lifetime of nonequilibrium carriers in semiconductors. The difficulties arising in connection with high a high excitation energy, disappear when indirect transitions in germanium and silicon semiconductors are utilized (N.G. Basov, O.N. Krokhin, and Yu.M. Popov, 1960). The minimum energy in the conduction band of these semiconductors, and the maximum energy in the valence band correspond to different values of the quasi-momentum of the electron (Fig. 4). The longest long-wave radiations correspond to the transition of the electron from the minimum conduction band into the maximum valence band, and at the same time a phonon is emitted so that the sum of the energies of photon and phonon equals  $\Delta$ . The width of the spontaneous radiation line in semiconductors equals  $kT$ . In semiconductors, a change in frequency by superposition of a magnetic field of  $\sim 1.5 \cdot 10^{-20} \frac{H}{m}$  is possible due to the low effective carrier mass  $m$ . For germanium it is 10% of the radiation frequency of intrazonal transitions in fields of  $H \sim 10^4$  Gauss. Probably it will soon be possible to develop generators of infrared and optical radiation which can be used in laboratories, and also in various fields of science and technology. There are 4 figures.

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Generation of coherent light ...

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B105/B215

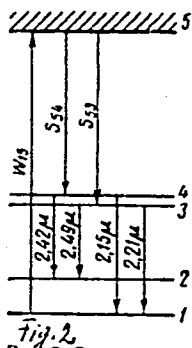


Fig. 2: Scheme of the level of  $U^{3+}$  in calcium fluoride.

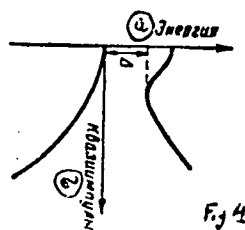


Fig. 4: Structure of energy band in semiconductor. Legend: (a) Energy; (b) quasi-momentum.

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BASOV, N.G.; KROKHIN, O.N.; POPOV, Yu.M.

Using indirect transitions in semiconductors for determining  
states with negative absorption coefficients. Zhur. eksp. i  
teor. fiz. 40 no.4:1203-1209 Ap '61. (MIRA 14:7)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.  
(Semiconductors) (Quantum mechanics)

25208

S/056/61/040/005/029/031

B125/B202

9.4300

AUTHORS: Bascov, N. G., Krokhin, O. N., Popov, Yu. M.

TITLE: Production of states with negative temperature in the p-n-junctions of degenerate semiconductors

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki. v. 40, no. 6, 1961, 1879-1880

TEXT: When applying a voltage in forward direction of a p-n-junction in a semiconductor the concentration of the minority carriers increases near the p-n junction. The maximum concentration of these carriers corresponds to the complete compensation of the potential barrier by an external field. It corresponds almost to that part of the crystal where the carriers are majority carriers. (In this case the p-n junction is regarded as a "reverse junction"). The negative temperature in the band-to-band transitions occurs only when the Fermi quasi-levels corresponding to the non-equilibrium concentrations of the electrons and holes satisfy the condition:  $\mu_n + \mu_p > \Delta$  (1). In this case  $\mu_n$  and  $\mu_p$  denote the Fermi

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S/056/61/040/006/029/031

B125/B202

Production of states with negative ...

"quasi-levels" of the electrons and holes, and  $\Delta$  the width of the forbidden band. When applying a voltage in forward direction to a p-n junction the carriers must be degenerate at least in one part of the p-n junction. Semiconductors with such p-n junctions proved to be tunnel diodes, the mechanism of the occurrence of these states with negative temperature studied here does not correspond to the tunnel part but to the volt-ampere part of the characteristics of the tunnel diode. In the p-n junctions of the strongly degenerate semiconductors a state with negative temperature occurs before the potential barrier is completely compensated. Therefore, the dispersion theory of a current passing through a p-n junction can be used for qualitative estimations. The minimum value of the external voltage  $U_{min}$  at which a state with negative energy still occurs, is  $U_{min} = \Delta/e$  where  $e$  is the charge of the electron.

The order of magnitude of the current density is  $I \sim -(eDn_p/L)\exp(eU/kT)$

where  $D$  denotes the diffusion coefficient,  $L$  the diffusion length, and  $n_p$  the electron density in the p-range of the semiconductor. The current density decreases with increasing degeneracy and also with decreasing

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S/056/61/040/006/029/031

B125/B202

Production of states with negative ...

temperature of the sample. For this reason a state with negative energy may be attained under steady operation. The spatial region in which a state with negative temperature occurs, is formed in the layer near the p-n junction with a density of the order of magnitude of one diffusion length. The high densities of the majority carriers surrounding the range of negative temperatures in the degenerate semiconductors can be used as radiation-reflecting surface, i.e., as resonator. The current density can be reduced if the semiconductors forming a p-n junction have different widths of the forbidden bands. For the observation of a negative temperature it is recommended to study the change of the volt-ampere characteristics on irradiation of the junction with the light of the corresponding frequency. There are 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc. The two references to English-language publications read as follows: L. Spak: Phys. Rev., 109, 603, 1958; J. I. Pankov: Phys. Rev. Lett., 14, 20, 1965.

ASSOCIATION: Fizicheskii institut im. P.M. Lebedeva Akademii nauk SSSR  
(Institute of Physics imeni P.M. Lebedev of the Academy of Sciences USSR)

SUBMITTED: April 16, 1965

Card 3/3

L 11085-63

EEC(b)-2/EWT(1)/EWG(k)/BDS--AFFTC/ASD/ESD-3--Pz-4--

AT/IJP(C)

ACCESSION NR: AT3002986

S/2927/62/000/000/0093/0095

AUTHOR: Basov, N. G.; Krokhin, O. N.; Popov, Yu. M.

TITLE: State with negative temperature in p-n transitions of degenerate semiconductors

SOURCE: Elektronno-dyrochnyye perekhody v poluprovodnikakh. Tashkent, Izd-vo AN UzSSR, 1962, 93-95

TOPIC TAGS: semiconductor negative temperature, population inversion, semiconductor interband transition, negative absorption coefficient

ABSTRACT: Population inversion with respect to interband transitions is possible only if at least one type of carrier is degenerate. Since transitions of this type are referred to the diffusive portion of the volt-ampere characteristic, negative temperature can be expected in a region, near the p-n transition, whose thickness is of the order of the diffusion length. Although cryogenic treatment can produce a population inversion at any value of current density, however small, a comparatively high nonequilibrium concentration of minority carriers is necessary to bring the value of the

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ACCESSION NR: AT3002986

negative absorption coefficient close to unity. The authors compute that a current density of  $10 \text{ amp/cm}^2$  is required in order to achieve a density of the injected minority carriers of  $10^{15} \text{ cm}^{-3}$ , assuming a diffusion coefficient of  $10 \text{ cm}^2/\text{sec}$  and carrier lifetime of  $10^{-10} \text{ sec}$ .

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 15May63.

ENCL: 00

SUB CODE: GE

NO REF SOV: 002

OTHER: 001

mcs/wm  
Card 2/2

POPOV, YU.M.

"Gallium-arsenide junction laser."

Report submitted to the Third Intl. Conference on Quantum Electronics,  
Paris , France            11-15 Feb 1963



ACCESSION NR: AT4001250

S/2504/63/023/000/0056/0000

AUTHORS: Levshin, V. L.; Arapova, E. Ya.; Blazhevich, A. I.; Voronov, Yu. V.; Voronova, I. G.; Gutan, V. B.; Lavrov, A. V.; Popov, Yu. M.; Fridman, S. A.; Chikhacheva, V. A.; Shchavenko, V. V.

LE: Study of cathode luminescence of zinc sulfide and other cathode phosphors

DE: AN SSSR. Fizicheskiy institut. Trudy\*, v. 23, 1963, 6-7

KEYWORDS: luminescence, cathode luminescence, phosphor, zinc sulfide phosphor, phosphorescence, photoluminescence, zinc sulfide excitation energy, phosphor excitation

ABSTRACT: This is a review article devoted to a theoretical and experimental analysis of excitation energy losses in cathode luminescence, the approximate maximum cathode luminescence yield, exchange

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ACCESSION NR: AT4001250

of energy between an electron beam and a layer of luminor through which it passes, and also the evolution of individual glow processes as functions of the excitation density and the temperature. Particular attention is paid to an investigation of the persistence properties of ZnS phosphors and their connection with the location and filling of the electron and hole localization levels. A detailed analysis is made of the energy losses resulting from thermalization of the electrons and holes, and it is shown that in cathode luminescence these unavoidable losses are very large and decrease the glow efficiency by approximately 2.5 times. Allowing for other losses, the over-all glow efficiency in cathode luminescence cannot exceed 0.27--0.30. The study of the passage of an electron beam through sublimated layers of zinc-sulfide luminors has established the voltage dependence of the electron penetration depth and the energy losses at different depths of electron penetrations. The dependence of the spectral composition, brightness, and energy glow yield of various zinc-sulfide and phosphate luminors on the current density,

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ACCESSION NR: AT4001250

voltage, and temperature were investigated. A glow efficiency of 0.256 was calculated for one type ZnS-Ag luminoz. The attenuation of glow of different types of cathode luminors to 0.1, 0.01, and 0.001 of the initial brightness was investigated and the presence of two superimposed de-excitation processes of different durations is established. The causes of the reduction in the duration of afterglow with increasing excitation density are considered. The arrangement and development of localization level of the investigated luminors was studied by the thermal de-excitation method and a connection was established between the attenuation and liberation of the levels at definite depths. "The authors are grateful to senior designer A. G. Ovchinnikov, radio technicians V. P. [unclear] and Yu. A. Platukhin, senior laboratory assistants Z. M. Brub, S. B. Kondrashkin, N. V. Mitrofanova, L. N. Petrakov, and A. D. Sy\*chkov and laboratory assistant V. P. Prokhorova who helped with the present work." Orig. art. has: 66 figures, 28 formulas, and 4 tables.

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ACCESSION NR: AT4001250

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 00

DATE ACQ: 30Nov63

ENCL: 00

SUB CODE: PH

NO REF SOV: 049

OTHER: 030

Card 4/4

POPOV, Yu. M.  
AID Nr. 976-3 24 May

MASER ACTION IN EXTERNALLY PUMPED SEMICONDUCTORS (USSR)

Popov, Yu. M. Fizika tverdogo tela, v. 5, no. 4, Apr 1963, 1170-1174.  
S/181/63/005/004/033/047

In connection with the problem of achieving a population inversion in semiconductors by laser- or electron-beam pumping, the energy distribution has been determined for current carriers whose energy exceeds that of the lattice by one or two orders of magnitude. The resulting distribution function consists of the usual Boltzmann term plus a small addition reflecting the presence of fast carriers due to the steady-state pumping source. The result shows that it is impossible under steady-state conditions to obtain population inversion between any intraband levels, regardless of the pumping intensity, if the excited carrier density is low enough for lattice collisions to play the main role. In fact, the condition for population inversion necessary for amplification or generation requires that carrier density in the conduction band be greater than  $10^{15}\text{cm}^{-3}$ ; this, however, will strongly increase the absorption and decrease the stimulated emission probability for the given transition.

[JA]

Card 1/1

BAGAYEV, V.S.; BASOV, N.G.; VUL, B.M.; KOPYLOVSKIY, B.D.; KROKHIN, O.N.;  
MARKIN, Ye.P.; POPOV, Yu.M.; KHVQSHCHEV, A.N.; SHOTOV, A.P.

Semiconductor quantum generator with a p-n junction in GaAs. Dokl.  
AN SSSR 150 no.2:275-278 My '63. (MIRA 16:5)

1. Fizicheskiy institut im. P.N.Lebedeva AN SSSR. 2. Chleny-  
korrespondenty AN SSSR (for Basov, Vul).  
(Masers) (Gallium arsenide crystals) (Junction Transistors)

L 18831-65 FWT(1)/ENG(v)/T/FMA(h) Feb IJP(c)/ASD(a)-5/SSD/KFWL/RAEM(i)/AS(ap)-2/  
ESD(gs)/ESD(t) AT S/0181/64/006/008/2445/2448  
ACCESSION NR: AP4043368

AUTHOR: Popov, Yu. M.

TITLE: Population inversion in semiconductors due to electron or  
optical excitation 21

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2445-2448

TOPIC TAGS: germanium, gallium arsenide, optical laser pumping,  
carrier density, phonon, crystal lattice specific heat, relaxation  
time

ABSTRACT: To obtain population inversion for interband transitions,  
degenerate electron and hole gas densities are necessary. However,  
the electrons and holes heated by external excitation transfer their  
energy by collisions to the whole electron-hole gas and thus raise  
its temperature with respect to the lattice temperature. The  
electron-hole gas temperature must not exceed the Debye temperature

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L 18831-65

ACCESSION NR: AP4043368

if degeneracy of nonequilibrium carriers are to be retained. In the first part of the present treatment it is assumed that the energy relaxation of a carrier by interaction with other carriers is faster than the energy transfer to the lattice and faster than the recombination. It is shown theoretically that, for example, for a nonequilibrium carrier lifetime of about  $10^{-6}$  sec in Ge ( $n \approx 10^{18} \text{ cm}^{-3}$ ) the electron temperature will differ only by several degrees from the lattice temperature. However, if this lifetime is much shorter than  $10^{-6}$  sec, as in GaAs, the electron temperature rise is sufficient to lift the carrier degeneracy and thus prevent population inversion. In the latter case one can use short pulses (shorter than the lifetime) or establish degeneracy by rapid removal of an exciting electron beam (decay time shorter than the lifetime). In the second part of the treatment it is assumed that hot electrons emit several optical phonons and then transfer the remaining part of their energy to the electron-hole gas. Under these conditions degeneracy in, say, GaAs ( $n \approx 10^{16} \text{ cm}^{-3}$ ) may be

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L 18831-65

ACCESSION NR: AP4043368

obtained only at liquid helium temperature where transfer of even 0.03 eV by each carrier raises the electron-hole gas temperature considerably and destroys population inversion. Orig. art. has: 10 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute, AN SSSR)

SUBMITTED: 02Mar64

SUB CODE: SS, EC

NR REF SOV: 008

ENCL: 00

OTHER: 005

Card 3/3

L 23410-66 EWP(e)/EWT(m)/EWP(w)/EWA(d)/EWP(v)/T/EWP(t)/EWP(k) IJP(c) JD/HM/HW

ACC NR: AP6004142

SOURCE CODE: UR/0125/66/000/001/0075/0076

73  
68  
B

AUTHOR: Pavliychuk, G. A.; Popov, Yu. M.

ORG: none

TITLE: Effect of the addition of various amounts of boron on the properties and weldability of EI437 nickel-base steel

SOURCE: Avtomaticheskaya svarka, no. 1, 1966, 75-75

TOPIC TAGS: boron, nickel steel, weldability, high temperature strength/EI437 nickel steel

ABSTRACT: The proneness of high-Ni heat-resistant alloys to form cracks in the near-weld zone during their fusion welding is a major obstacle to the use of these alloys in weldments. In this connection, the authors describe the effect of the addition of various amounts of boron (0.005% and 0.45%) on the properties and weldability of EI437 alloy. It is established that the strength and yield point of EI437 alloy treated with 0.45% B are higher than those of the untreated specimens. This is particularly evident at high temperatures: at 800°C strength and yield point increase

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UDC: 621.791.762:66.046.51:546.27

L 23410-66

ACC NR: AP6004142

40-45%. What is more, stress-rupture tests at 800°C under a load of 29 kg/cm<sup>2</sup> showed that the time to rupture for specimens treated with 0.45% B is nearly 10 times as long as that of untreated specimens and 4 times as long as that of specimens treated with 0.005% B. As for weldability, no cracks in the weld and near-weld zones of the specimens treated with 0.45% B were detected, whereas large hot cracks were observed under analogous conditions in the alloy EI437B treated with 0.005% B. Thus, treating austenitic Nimonic-type alloys with 0.5% B is an effective means of enhancing their mechanical and high-temperature strength while at the same time preserving their high plasticity. When used as weld metal, owing to the presence of a two-phase austenite-boride structure, these alloys are not prone to form hot cracks in the weld and in the near-weld zone during their fusion welding. Orig. art. has: 2 figures and 2 tables.

SUB CODE: 11, 13, 20/ SUBM DATE: none/ ORIG REF: 000/ OTH REF: 000

Card 2/2 *dda*

L 31161-66 EWT(1)/EWT(m)/T/EWP(t)/ENA(h) IJP(c) JD/WA/AT

ACC NR: AP6006812

SOURCE CODE: UR/0181/66/008/002/0345/0352

AUTHOR: Poluektov, I. A.; Popov, Yu. M. 43 13

ORG: Physics Institute im. P. N. Lebedev AN SSSR, Moscow (Fizicheskiy institut AN SSSR)

TITLE: Effect of a strong magnetic field on the energy distribution and slowing-down times of nonequilibrium current carriers in semiconductors 21, 49, 45

SOURCE: Fizika tverdogo tela, v. 8, no. 2, 1966, 345-352 21, 49, 45

TOPIC TAGS: strong magnetic field, current carrier, semiconductor theory, semiconductor band structure

ABSTRACT: The authors consider the effect of a strong magnetic field ( $H\Omega \gg kT$ ) on the energy distribution and slowing-down times of nonequilibrium current carriers in semiconductors where the external excitation source creates electron-hole pairs with an energy which is much greater than the thermal energy. The distribution function which is derived for the current carriers is not monotonic and may fluctuate on Landau levels. The slowing-down time in conditions where  $H\Omega \ll kT$ .

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L 31161-66  
ACC NR: AP6006812

( $\epsilon$  is the energy of a nonequilibrium electron or hole), are weakly dependent on the magnetic field. An analysis of the results indicates that is practically impossible to amplify emission by using intraband transitions in semiconductors placed in a magnetic field. Orig. art. has: 15 formulas.

SUB CODE: 20/

SUBM DATE: 15Jun65/

ORIG REF: 003/

OTH REF: 003

Card 2/2 *LC*

L 29528-66 EWT(1) IJF(c)

ACC NR: AP6011654

SOURCE CODE: UR/0020/66/167/003/0559/0561

AUTHORS: Poluektov, I. A.; Popov, Yu. M.

62  
B

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR  
(Fizicheskii institut Akademii nauk SSSR)

TITLE: Influence of a <sup>2/</sup>strong magnetic field on <sup>2/</sup>recombination radiation  
in semiconductors

SOURCE: AN SSSR. Doklady, v. 167, no. 3, 1966, 559-561

TOPIC TAGS: recombination radiation, semiconductor carrier, semiconductor band structure, distribution function, solid state laser, stimulated emission, line width

ABSTRACT: To check whether a magnetic field is capable of changing the state density in a semiconductor, the authors calculated the intensity of recombination radiation in a magnetic field for an interband transition in semiconductors, and determined the emission line shape assuming that the electron and hole distribution functions are given for the conduction and for the valence bands. An equation is derived for the number of quanta of specified frequency emitted per unit time during a spontaneous transition of specified line width, and the electron frequency at which the magnetic field becomes influential is determined from this

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ACC NR:

AP6011654

equation. On approaching the spontaneous generation threshold, the line width, expressed in terms of the effective temperature, becomes close to 3K, and when the sample temperature exceeds this value the emission line becomes narrower. The results explain the laser action obtained in indium antimonide in a magnetic field and the drop in the generation threshold in indium arsenide when an external magnetic field is applied. It is noted in conclusion that the emission line shape has the same shape for transitions from the conduction band to an acceptor level than in the valence band, where the magnetic field still has no great effect on the energy spectrum of the holes. This report was presented by Academician D. V. Skobel'tsyn 13 July 1965. Orig. art. has: 12 formulas

SUB CODE: 20/ SUBM DATE: 08Jul65/ ORIG REF: 002/ OTH REF: 007

Card

2/2

JS

E 28449-66 . FED/ENT(1)/ENT(m)/EEG(k)-2/T/ENF(t)/ETI/ENP(k) IJP(c) WO/JD

ACC NR: AP6018703

SOURCE CODE: UR/0386/66/003/011/0441/0443

AUTHOR: Basov, N. G.; Zakharov, Yu. P.; Nikitina, T. F.; Popov, Yu. M.; Strakhovskiy, G. M.; Tatarenkov, V. M.; Khvoshchev, A. N.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Gallium arsenide laser operating at room temperature

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pisma v redaktsiyu. Prilozheniye, v. 3, no. 11, 1966, 441-443

TOPIC TAGS: gallium arsenide, semiconductor laser, pn junction, junction diode, laser radiation spectrum

ABSTRACT: The authors investigated the performance of semiconductor lasers based on diffusion p-n junctions operating at 300K. The diodes were excited either with a pulse generator (current up to 4000 amp, pulse duration 20 nsec) or with a generator with discharge capacitor and mechanical discharge with current up to 1500 amp and pulse duration 30-60 nsec. The diode emission had at low currents a broad spectrum that narrowed down gradually from 300 to 110 Å with increasing current. At a threshold current density that varied from diode to diode ( $10^5 - 5 \times 10^5$  amp/cm<sup>2</sup>), a single generation line was produced at ~9000 Å, which is of longer wavelength than the maximum of the spontaneous emission spectrum. With increase in current, additional lines appear in the spectrum, corresponding to different resonator modes and the

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ACC NR: AP6018703

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generation wavelength increases. Measurement of the diode emission directivity pattern yielded for the width of the luminescent region a value of  $4 \mu$ . The directivity pattern in a plane parallel to the p-n junction shows a pronounced multilobe interference character, with average half-width  $8^\circ$ . Orig. art. has: 2 figures and 1 formula. [02]

SUB CODE: 20/ SUBM DATE: 02Apr66/ ORIG REF: 002/ OTH REF: 002/ ATD PRESS:

5006

Card 2/2 IC

L 9461-66 FBD/EWT(1)/EEC(k)-2/I/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c) WG  
 ACC NR: AP5027406 SOURCE CODE: UR/0181/65/007/011/3289/3293  
 AUTHOR: Basov, N. G.<sup>44</sup>, Bogdankevich, O. V.<sup>44</sup>, Popov, Yu. M. <sup>44</sup> 57  
 ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR) 3  
 TITLE: Generation of short-wavelength radiation and lifetimes with respect to spontaneous emission in semiconductors  
 SOURCE: Fizika tverdogo tela, v. 7, no. 11, 1965, 3289-3293  
 TOPIC TAGS: semiconductor, semiconductor laser, electron beam laser  
 ABSTRACT: The possibility of fabricating electron-beam-pumped semiconductor lasers generating in the ultraviolet spectral range is discussed. The analysis is limited to direct interband transitions and does not include the case when carriers must be treated as polarons. It is shown that the lifetime of excess carriers with respect to interband transitions accompanied by emission of a photon is inversely proportional to the energy width of the forbidden gap. The lifetime of radiationless transitions is thus neglected in the analysis. Expressions are derived for the minimal pump power and the optimal duration of the excitation pulse. It is suggested that high-purity ZnS, aluminum and boron phosphides, corundum, and other wide-gap semiconductors should be tested for laser action in the ultraviolet by means of electron beam excitation. Orig. art. has: 11 formulas. [CS]  
 SUB CODE: 20/ - SUBM DATE: 28May65/ ORIG REF: 008/ OTH REF: 005/ ATD PRESS: 4/55  
 Card 1/1 pu

L 23388-66 EFF(n)-2/EEC(k)-2/EWA(h)/EWT(d)/EWT(l)/EWP(k)/FBD/T IJP(c) WG/WW

ACC NR: AT6009311 SOURCE CODE: UR/2504/65/031/000/0003/0073

AUTHOR: Popov, Yu. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences,  
SSSR (Fizicheskii institut Akademii nauk SSSR)

TITLE: Methods of obtaining states with negative temperature in  
semiconductors

SOURCE: AN SSSR. Fizicheskii institut. Trudy, v. 31, 1965.  
Kvantovaya radiofizika (Quantum radio physics), 3-73

TOPIC TAGS: solid state laser, laser theory, semiconductor  
theory, thermodynamic analysis, electromagnetic radiation, excited  
state, excitation energy, semiconductor research

ABSTRACT: This paper is a dissertation presented as part of a re-  
quirement for the degree of Doctor of Physico-Mathematical Sciences  
in 1963. By analysis of the interaction between the electromagnetic  
radiation and the medium in a solid state laser, the author derives  
the conditions for formation of thermodynamics nonequilibrium states

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ACC NR: AT6009311

in semiconductors (states with negative temperature), necessary for the amplification of the electromagnetic radiation. The satisfaction of the necessary conditions for the various methods of the excitation of the semiconductor are discussed, with emphasis on the energy efficiency of the excitation. Much attention is paid in the paper to the possibility of using indirect transitions in semiconductors for amplification of radiation. The paper consists of six chapters. The first is devoted to methods of obtaining states with negative temperature by exciting a homogeneous semiconductor with electric-field pulses. The second considers the production of such states by injection of minority carriers into a region close to the pn junction of a degenerate semiconductor. The third deals with the use of indirect transitions in certain semiconductors (such as germanium or silicon) for amplification of electromagnetic radiation. The fourth considers the possibility of obtaining states with negative temperature in semiconductors excited by an electron beam with energy of several dozen or several hundred keV or by powerful illumination from lasers. The fifth contains calculations of the slowing-down time of the nonequilibrium currents which are not in

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ACC NR: AT6009311

thermodynamic equilibrium with the lattice. The sixth is devoted to a determination of the distribution function of nonequilibrium carriers inside the corresponding band in the case of a monochromatic source. Different methods of obtaining negative-temperature states are compared in the conclusion. Appendices deal with the calculation of the cross sections of triple recombination in semiconductors and the calculation of the gain in the case of direct transitions in semiconductors. The author thanks Corresponding Member AN SSSR N. G. Basov and Candidate of Physico-Mathematical Sciences O. N. Krokhin for a useful discussion of the problems touched upon in the work. Orig. art. has: 204 formulas and 4 figures.

SUB CODE: 20/

SUBM DATE: none/

ORIG REF: 040/

OTH REF: 045/

Card

3/3 *do*

ICPCV, YU. N.

FA 29T52

USSR/Hydrology  
Glaciers

May/June 1947

"Contemporary Glaciation in Northeastern Asia and the  
Problems Presented by Old Glaciers," Yu. N. Popov, 9 pp

"Is Vsesoyuz Geog Obshchestvo" Vol LIII, No 3

The only existing articles on glaciation in the north-  
east until recently were by Chersky, who discussed  
the paleontological aspects, and Orucher, who dis-  
cussed the basic geological aspects of glaciers. Many  
articles have appeared recently, however, due to an  
increased interest in this field. This article gives  
a brief summation of information on the ancient gla-  
ciation of mountains in Northeastern Siberia, present-  
day glaciation in northeastern Siberia, discoveries  
of soft parts of animals in diggings from frozen  
layers of the Pleistocene era, and the paleogeography  
of the glacial age in Northeastern Siberia.

IC

20752

POPOV, Yu.N.

Arctotiroliites, a new name for Pseudotiroliites Popov, 1962,  
non Sun, 1939. Uch. Zap. NII GA no.1:112 '63. (MIRA 17:7)

VOZIN, Valentin Fedorovich; TIMONINOVA, Vera Vasil'yevna; IOPOV,  
Yu.N., ed. red.

[Field atlas of Triassic bivalves and cephalopod mollusks  
in the northeastern part of the U.S.S.R.] Polevoi atlas  
dvukhtsvorezhnykh i golovenogikh molliuskov triasovykh ot-  
lozhenii severo-Vostoka SSSR. Moskva, Nauka, 1964. 195 p.  
(MIRA 17:2)



KRYZHEK, K.F.; NGUYEN, A.N.; KOZOV, Yu.N.

Boundary of Indukil and Olenek stages in the Verkhoyansk  
Range. Uss. zap. NIIIG no.1:26-34 '63. (MIR 17:7)

ACCESSION NR: AT4016826

8/2604/63/000/048/0066/0072

AUTHOR: Popov, Yu. M.

TITLE: Some results of logging on the Azov Sea

SOURCE: Moscow. Vsesoyuznyy nauchno-issledovatel'skiy institut geofizicheskikh metodov razvedki. Razvedochnaya i promyshlovaya geofizika (Prospecting and industrial geophysics), no. 48, 1963, 66-72

TOPIC TAGS: geophysics, logging, sea logging, electrical prospecting, electrical profiling

ABSTRACT: In the years 1959-1961 a maritime expedition of the VNIIGeofizika carried out an electrical prospecting study on the Sea of Azov by dipolar sounding and depth profiling. Measurements were made at separate points in the same way as on land. The most important feature of marine prospecting is the possibility of measurement while travelling, using the continuous electrical profiling method. About 600-800 km of profile were obtained per month. The errors reached about 5-7%. On the basis of prospecting and all available geological and geophysical data, it may be considered that the Paleozoic stratum is lifted at the center of the Sea of Azov. Deep-sea drilling may be

Card

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USTRITSKIY, Vitaliy Ivanovich; CHERNYAK, Georgiy Yevseyevich;  
POPCOV, Yu.N., doktor geol.-mineral.nauk,red.; DESHALYT, M.C.,  
vedushchiy red.

[Biostratigraphy and brachiopods of the Upper Paleozoic of  
the Taymyr Peninsula.] Biostratigrafiya i brakhiopody verkhnego  
paleozoya Taimyra. Leningrad, Gostoptekhizdat, 1963. 138 p.  
(Leningrad. Nauchno-issledovatel'skii institut geologii arktiki.  
Trudy, vol. 134) (MIRA 17:6)

POPCV, YU. N.

"New Finds of Remains of Pleistocene Animals in Northeastern USSR, " Priroda, No. 3,  
1948.

POPOV, YU. N.

USSR/Medicine - Fossils  
Medicine - Taxonomy

Aug 48

"New Members of the Kolymia Licharewi Family," Yu. N.  
Popov, 3 3/4 pp

"Dok Ak Nauk SSSR" Vol LXI, No 4

Describes specimens of Kolymia Licharewi found in  
Upper Permian strata in northeast Asia, including  
three new species. Submitted 5 Jun 48.

11/49T75

POPOV, YU. N.

PA 5/49T26

USSR/Geography  
Ice Formation

Mar/Apr 48

"A Present-Day Icecap in the Northeastern USSR,"  
Yu. N. Popov, 1 p

"Iz v-s Geog Obshch" Vol LXXX, No 2

First reports of the "frozen area," which appeared  
in 1946, are now known to have been exaggerated.  
Present estimate in sq km is: in Svanar-Khayata  
range, 160; in Buordakk Massif, 94.26; total, 254.26.

5/49T26

POPOV. YU. N.

"Discovery of a Siberian Rhinoceros in Indigirka," Priroda, No. 12, 1949.

GTRSP L Vol. 5-No. 1 Jan. 1952

Popov, Yu.N., Complex division of suture lines of the *Nautiloidea*, 765-7

Akademiya Nauk, S.S.S R., Doklady Vol. 78, No. 4 - 1951



POPOV, Yu.N.

Glaciers of the Buordakh Massif. Geog.sbor. 4:41-58 '54. (MLBA 7:9)  
(Buordakh Massif--Glaciers) (Glaciers--Buordakh Massif)

POPOV, Yu.N.

Paleoecology of Estheria. Dokl.AN SSSR 94 no.4:769-770 P '54.

(MIRA 7:2)

(Branchiopoda, Fossil)

POPOV, Yu.N.

Asymmetric segmentation of lacinate lines of Triassic ammonites.  
Dokl.AN SSSR 95 no.2:381-383 Mr '54. (MIRA 7:3)  
(Ammonoidea)

Popov, Yu. N.

USSR/Geology - Paleontology

Card 1/1      Pub. 22 - 48/60

Authors      :    Popov, Yu. N.

Title        :    The ecology of tertiary wood borers of the Teredidae family

Periodical   :    Dok. AN SSSR 100/4, 789-791. Feb 1, 1955

Abstract     :    Geological data are presented regarding the ecology of Tertiary period wood borers belonging to the Teredidae family. Four references: 3 USSR and 1 Dutch (1905-1950). Illustrations.

Institution   :    Scientific Research Institute of Arctic Geology

Presented by:    Academician E. N. Pavlovskiy, November 5, 1954

POPOV, Yu.N., kandidat geologo-mineralogicheskikh nauk (Leningrad)

~~and original chalcedony geodes~~

Original chalcedony geodes. Priroda 45 no.3:115-116 Mr '56.  
(Geodes) (MIRA 9:7)

POPOV, Yu.M.

Finds of fossil animals in frozen ground. Priroda 45 no.9:40-48 S  
'56. (MIRA 9:10)  
(Siberia--Mammoth) (Siberia--Rhineceros, Fossil)

KIPARISOVA, L.D.: POPOV, Yu.N.

Separation of the lower Triassic system into divisions. Dokl. AN SSSR  
109 no.4:842-845 Ag 1956. (MLRA 9:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy geologicheskii institut.  
Predstavleno akademikom D.V. Halivkinym.  
(Geology, Stratigraphic)

POPOV, Yu.N.

Hedenstroemiidae of the Verkhoyansk-Kolyma region. Ezhegod. Vses.  
paleont. ob-va 16:64-81 '57. (MIRA 11:4)  
(Verkhoyansk Range--Ammonoidea)  
(Kolyma Range--Ammonoidea)



POPOV, Yu.N.

Finding of ammonite shells with impressions of the soft parts of the  
body on the Kuba Island. Ezhegod. Vses. paleont. ob-va 16:289-290  
'57. (MIRA 11:4)

(Kuba Island--Ammonoidea)

POPOV, Yu. N., Doc Geol-Min Sci -- (diss) "Triassic cephalopods  
of Northeastern USSR. (Paleontological <sup>substantiation</sup> foundations of ~~the~~ <sup>unified</sup>  
~~united~~ scheme of cross sections of Triassic deposits of North-  
eastern USSR.)" Len, 1958. 22 pp (All-Union Sci Res ~~Inst~~ <sup>of</sup>  
Geol Inst). List of author's works, pp 21-22 (26 titles) (KL,  
35-58, 106)

POPOV, Yu.N.

Tectonic characteristics of the northeastern part of Asia [with summary in English]. Sov. geol. 1 no.8:37-53 Ag '58.

(MIRA 11:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut geologii Arktiki.  
(Soviet Far East -- Geology, Structural)

SOV-26-58-3-13/51

AUTHOR: Popov, Yu.N., Candidate of Geologo-Mineralogical Sciences

TITLE: Deposits of the Upper Triassic System on Franz-Joseph Land  
(Otlozheniya verkhnego triasa na zemlye Frantsa-Iosifa)

PERIODICAL: Priroda, 1958, Nr 3, p 72 (USSR)

ABSTRACT: An expedition of the Nauchno-issledovatel'skiy institut geologii Arktiki (Scientific Research Institute of the Geology of the Arctic) under the direction of Geologist V.D. Dibner, studied the geological formation of the islands of Franz-Joseph Land, which were traced back to the Jurassic period. The assistant of the expedition, L.P. Pirozhnikov, succeeded in finding rock older than the Jurassic period on Vil'chek Island. Northwest of Cape Gans, at the impact line of water and the base of the abrasive sea terrace, outcrops of dark grey limestones and slates with siderite nodules were discovered. From these rocks, ammonite shells, nautiloid and bivalvia, that differ from the Jurassic forms, were taken. Determination under field conditions and later investigation by Yu.N. Popov in Leningrad showed that the ammonites belonged to the Sirenites senticosus (Dittmar), Anasirenites cf. ebeli Mojsisovics, Halobia zitteli Lindstr. and other forms

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